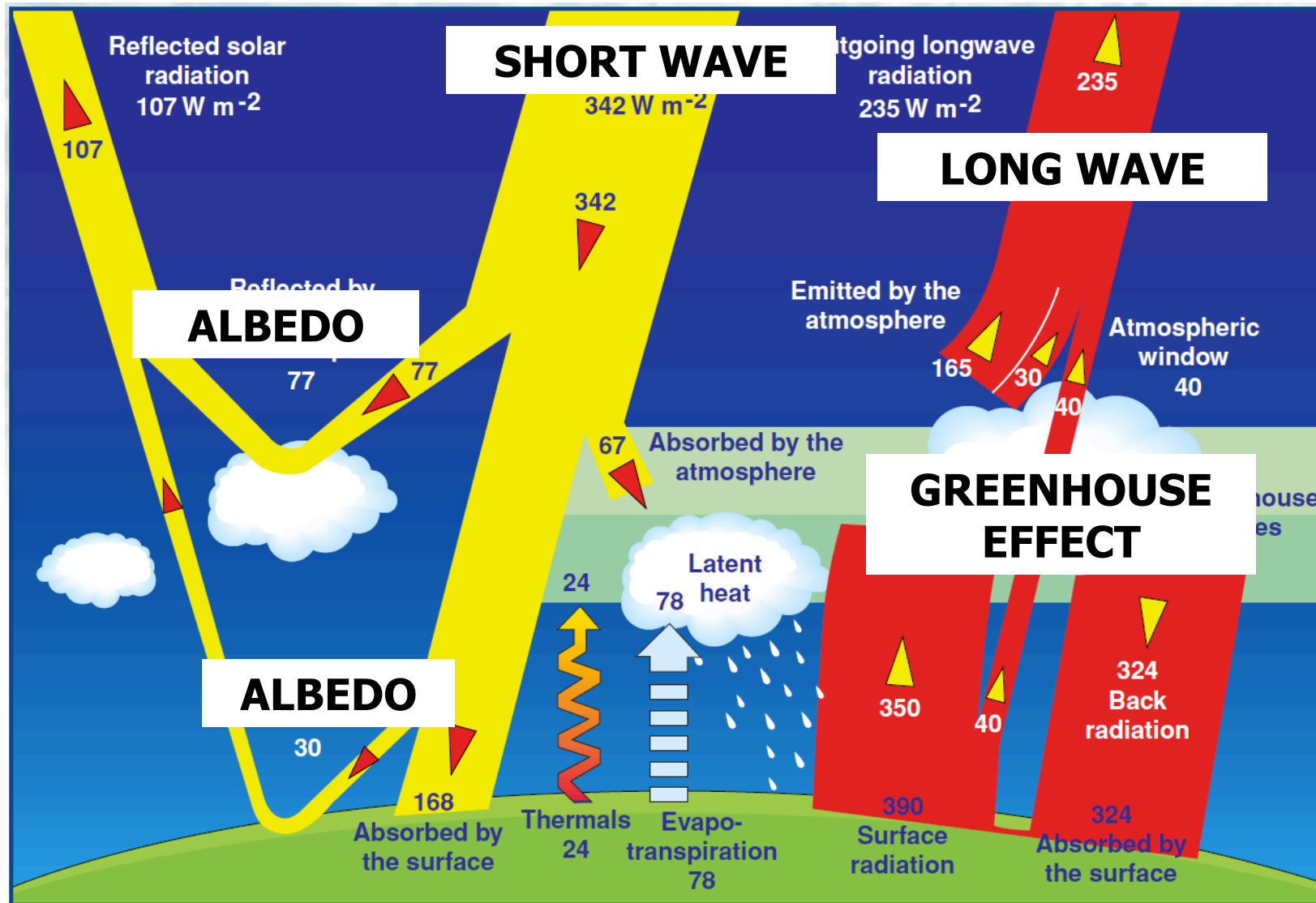


Radiative budget and green-house effect

– Students restitution –

06 July 2010



Radiation Balance of the Earth (Jeffrey T. Kiehl and Kevin Trenberth)

Radiation solar tracker : measures radiative flux at ground

- On roof-top
- Away from infrastructure, trees & tall objects..

■ Long-Wave

- Infrared radiometer
- $3\mu\text{m}$ - $14\mu\text{m}$ (IR)
- Black opaque semiconductor material
- Detector/sensor



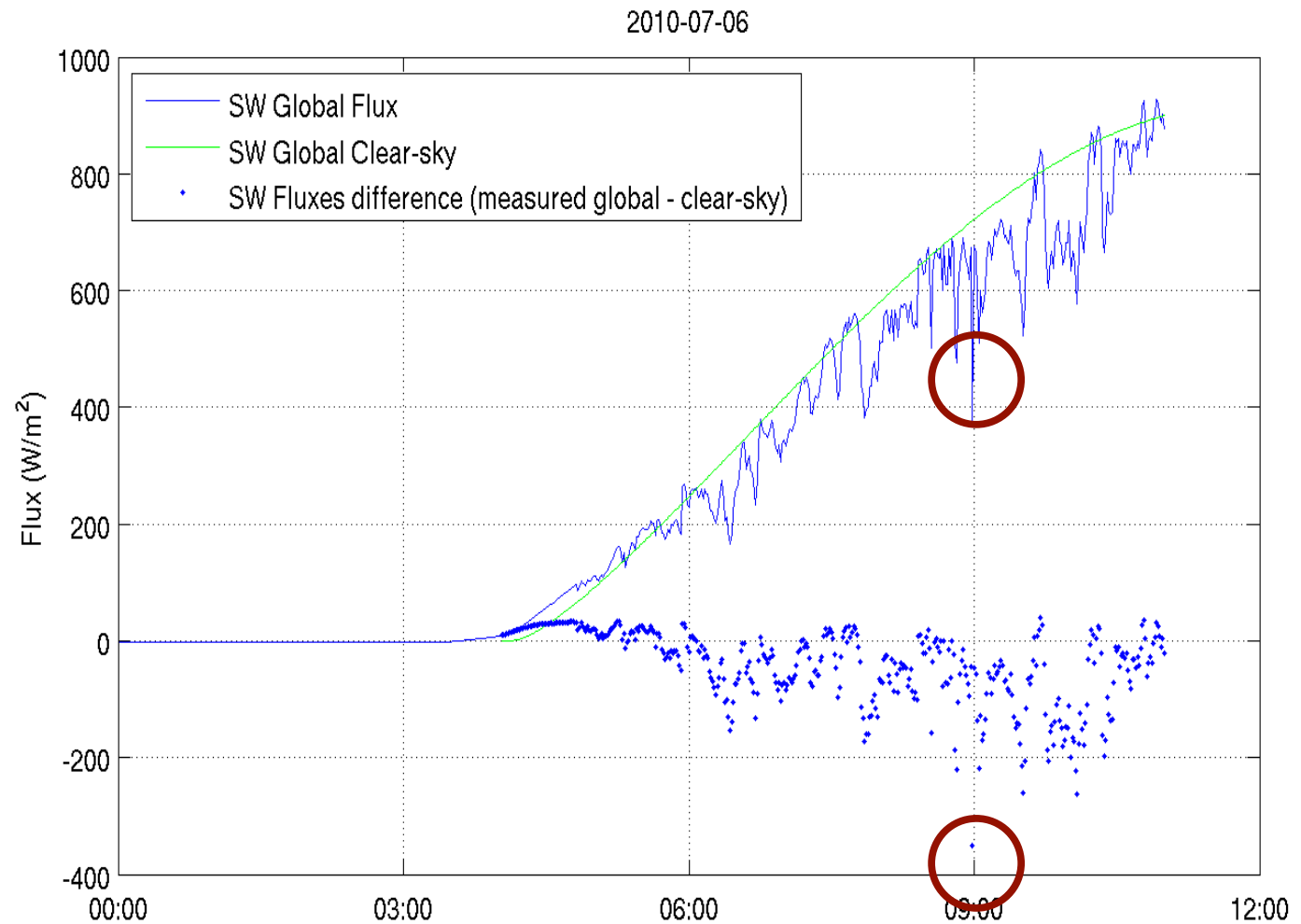
■ Short-Wave

- Global & diffuse radiometer
- $0.3 - 3 \mu\text{m}$ (visible)
- Transparent double-layered glass
 - Detector/sensor

Sunrise ~ 5 am

Maximum: 940 W/m²

*Variations – Cirrus
Cloud Cover today*



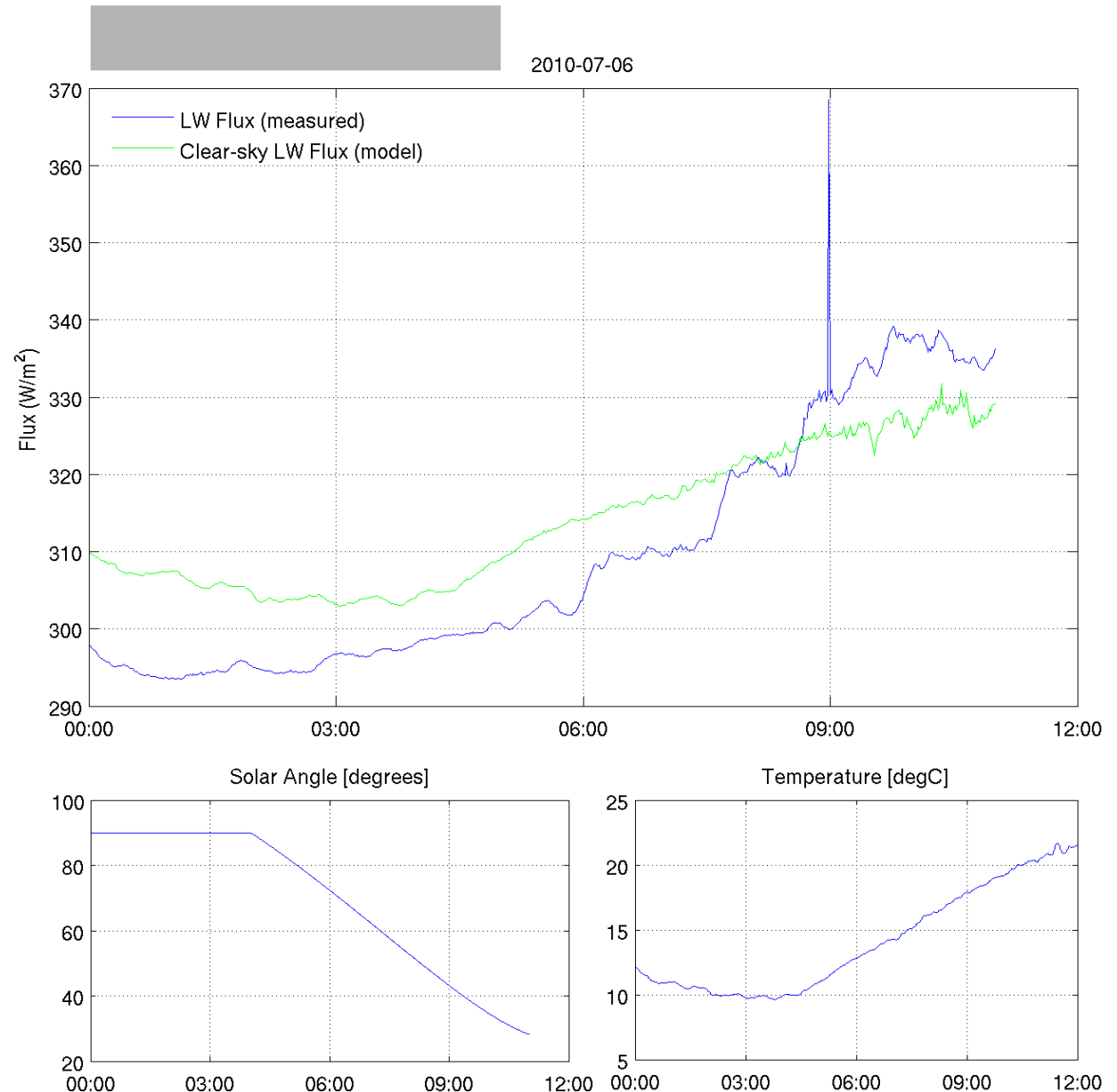
→ green: model (without clouds)

blue: measurement

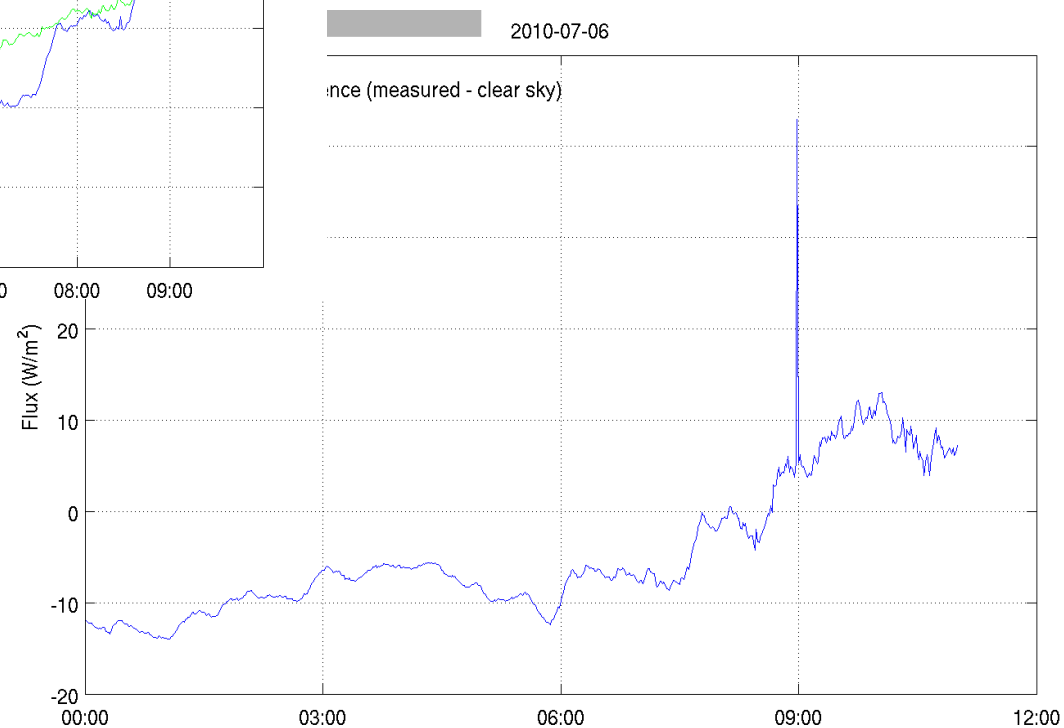
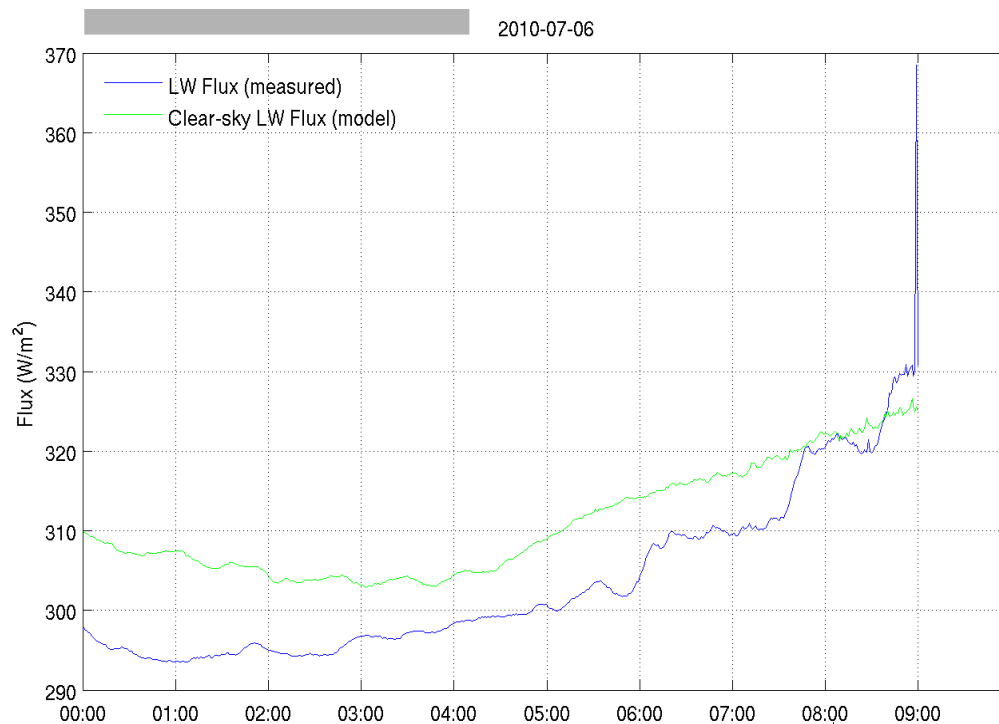
→ green line is above blue line
due to the absence of aerosols

→ more clouds = higher long-
wave radiation

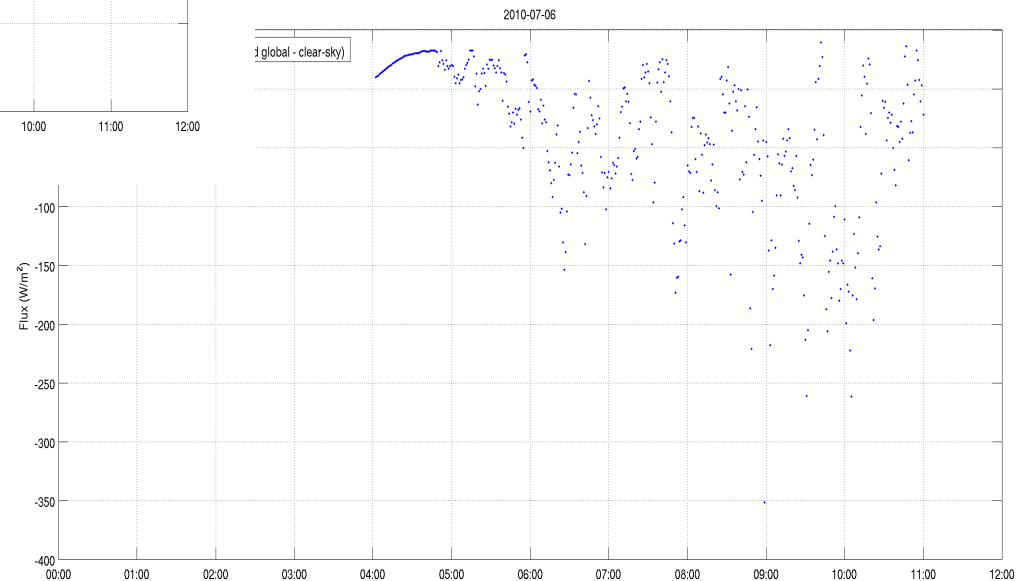
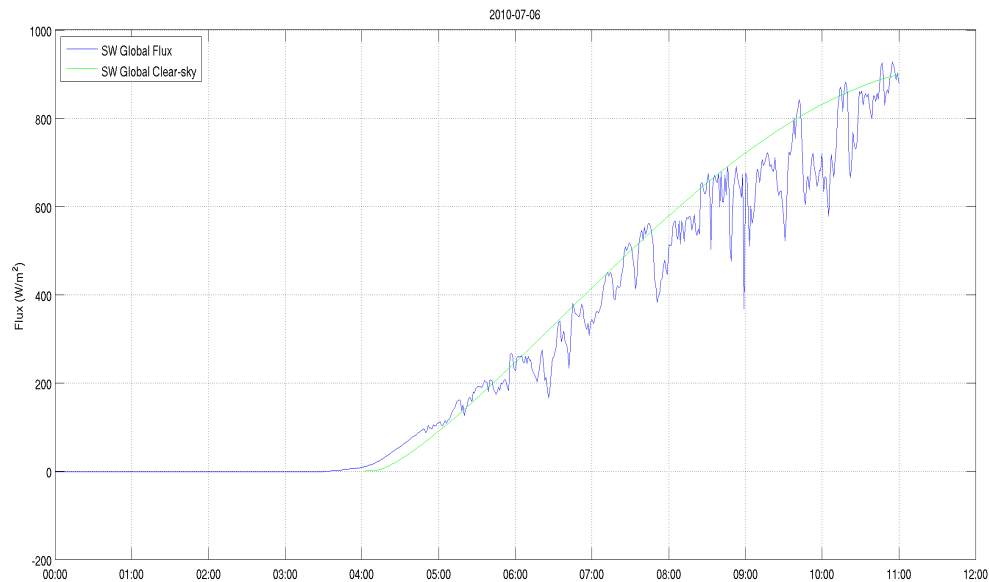
→ cloud simulation with hand:
temperature influence



Long wave radiative forcing

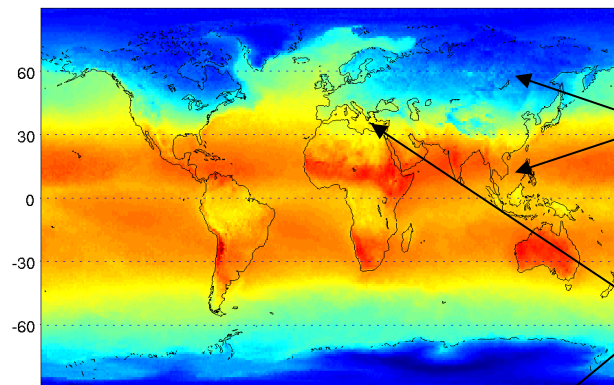


Short wave radiative forcing



LW clear sky

LWUPCLR
Jan-Feb-Mar 2008

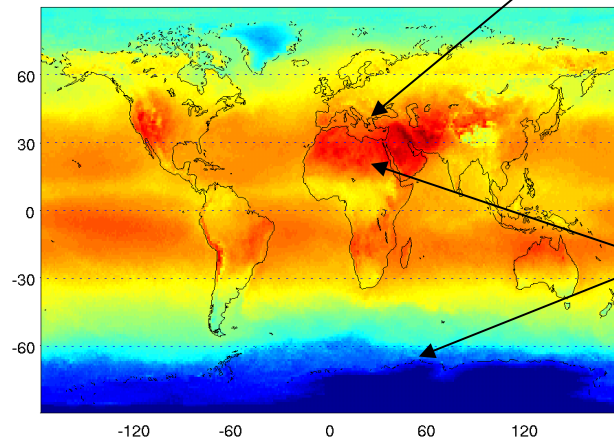


JFM

latitude

season

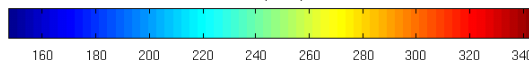
Jul-Aug-Sep 2008



JAS

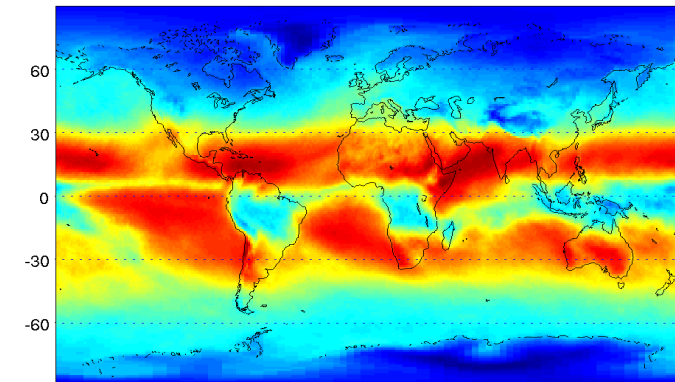
surface

Flux (W/m²)

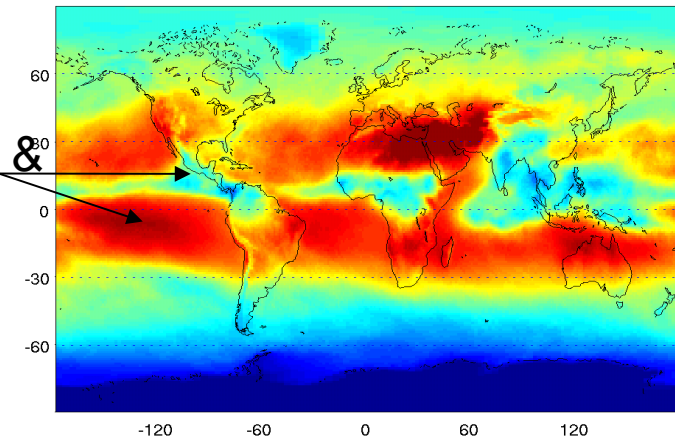


LW with cloud

LWUP
Jan-Feb-Mar 2008



Jul-Aug-Sep 2008



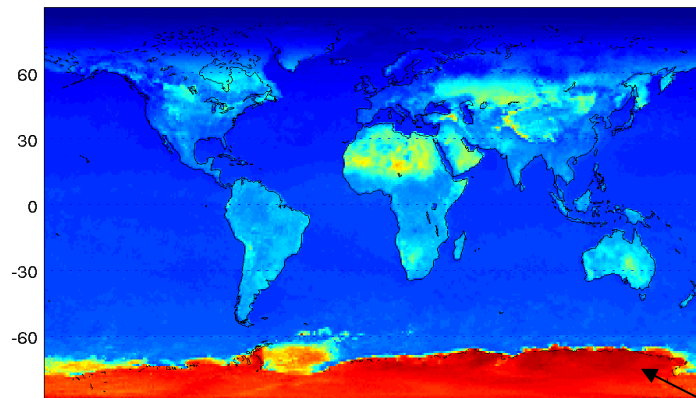
surface &
clouds

Flux (W/m²)



SW clear sky

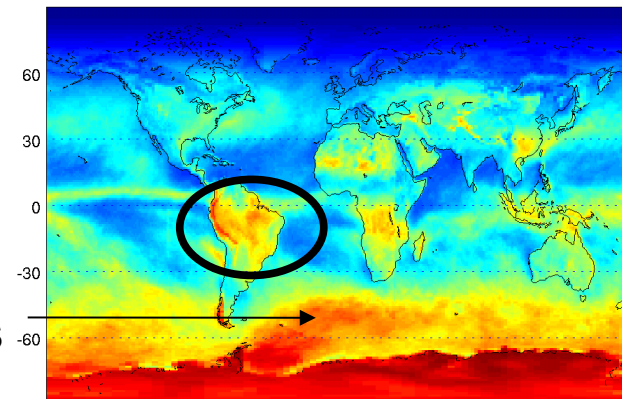
SWUPCLR
Jan-Feb-Mar 2008



JFM

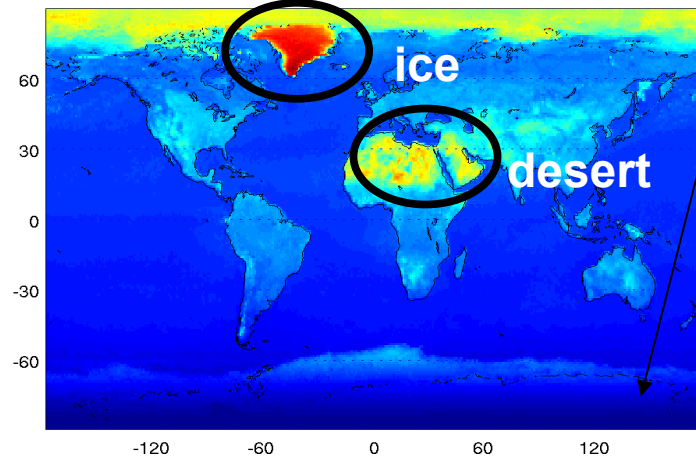
SW with cloud

SWUP
Jan-Feb-Mar 2008



clouds

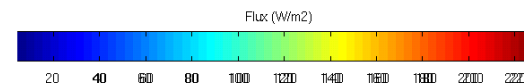
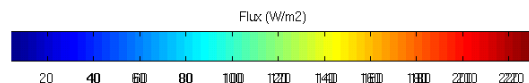
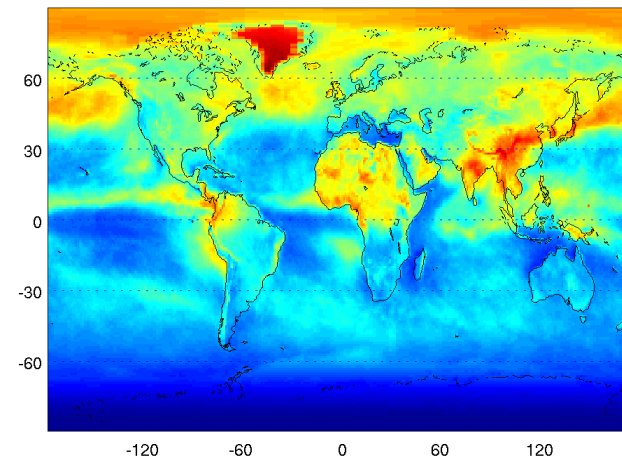
Jul-Aug-Sep 2008

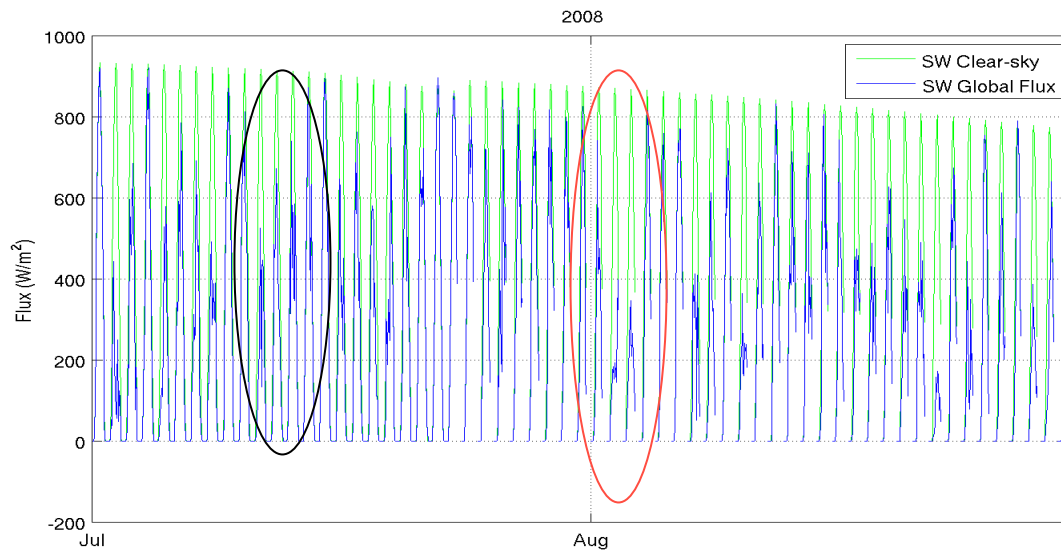


season

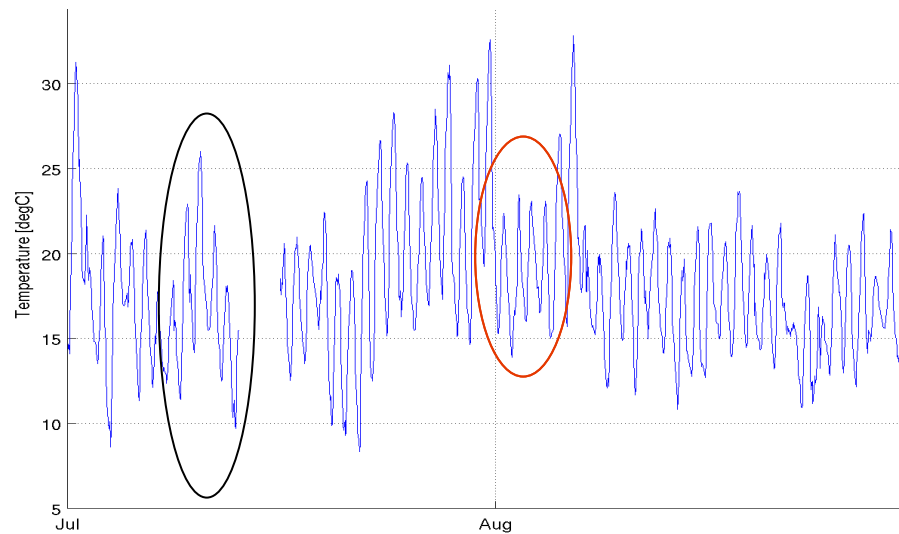
JAS

Jul-Aug-Sep 2008

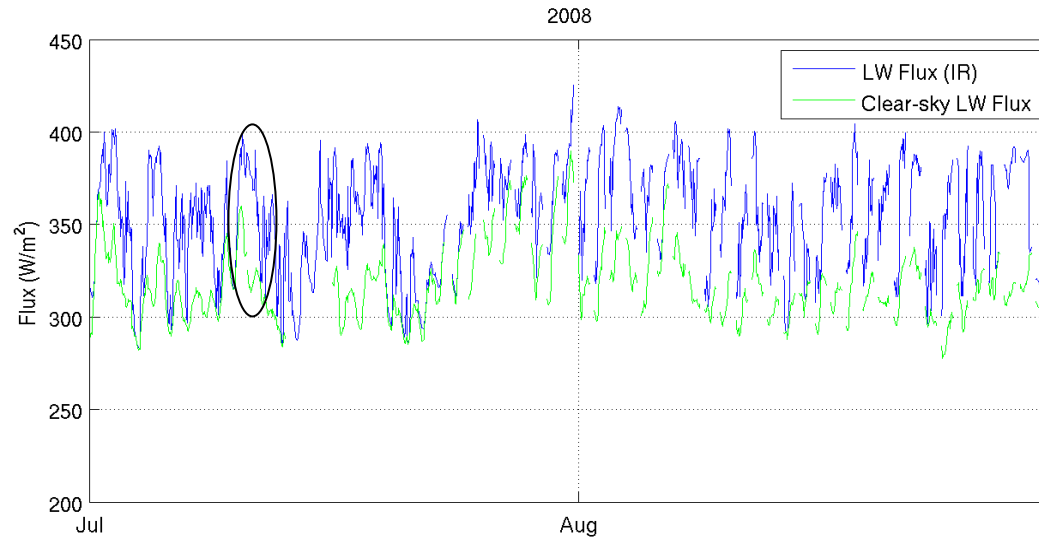




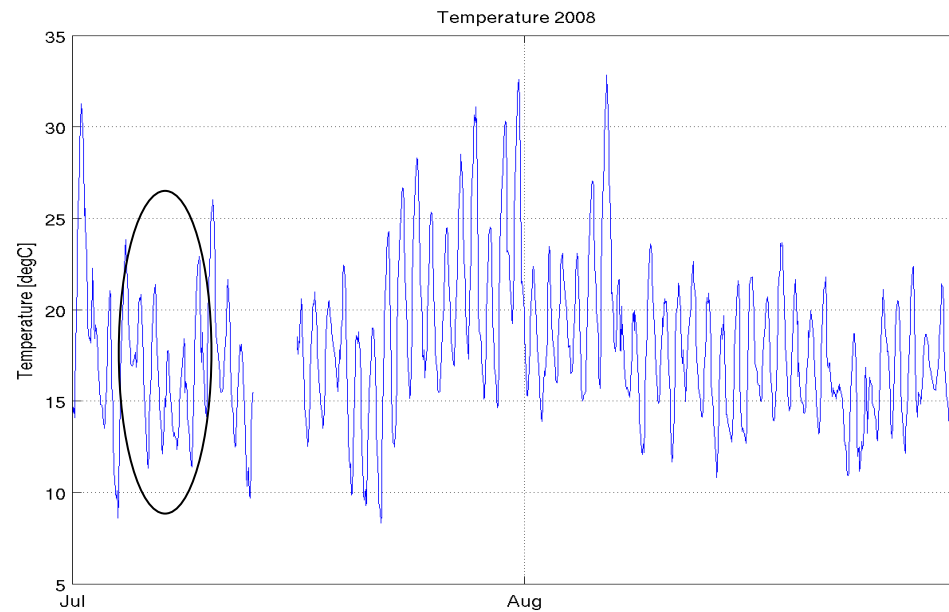
SHORT WAVE RADIATION



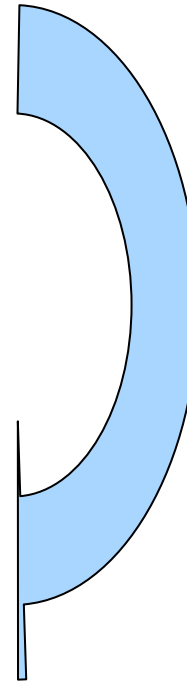
ALBEDO EFFECT



LONG WAVE
RADIATION

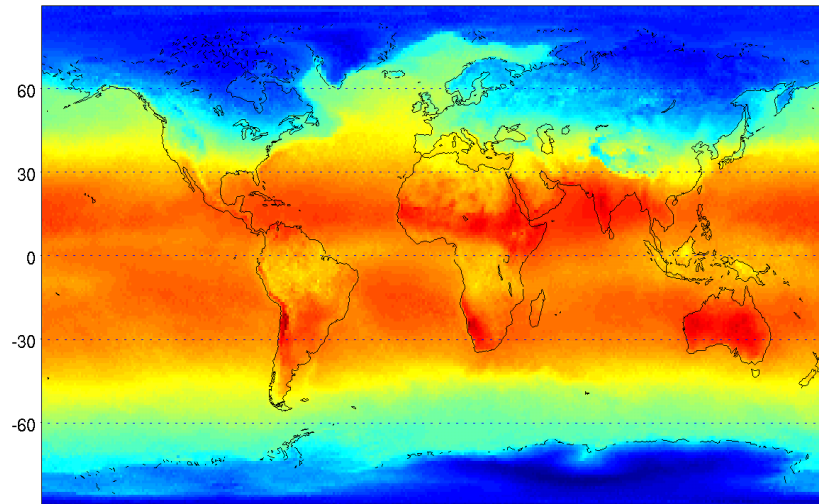


GREENHOUSE EFFECT

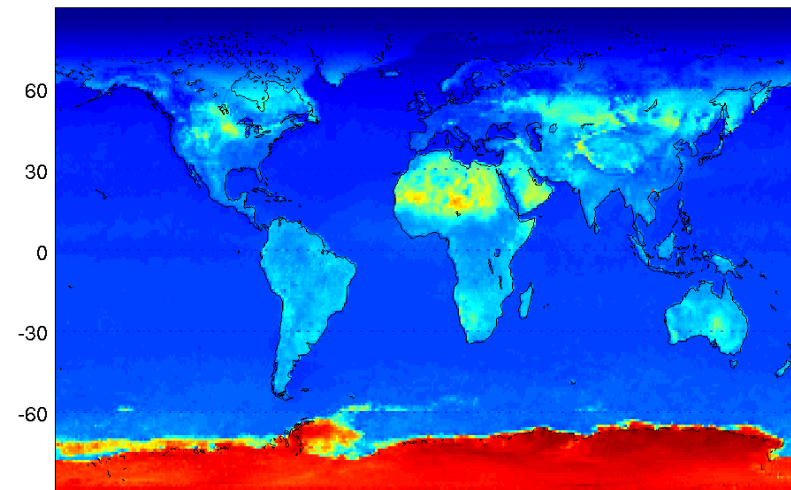


8. Highlight of green-house and Albedo effects – Clear Sky

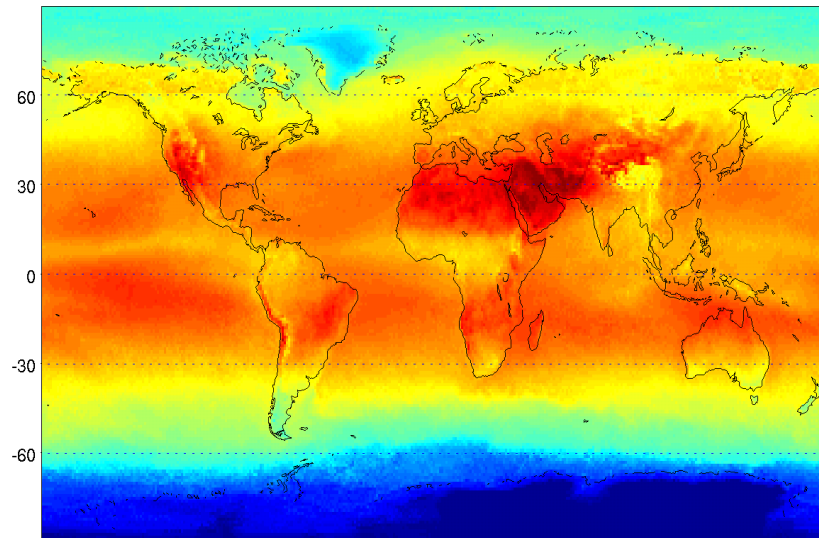
LWUPCLR
Jan-Feb-Mar 2009



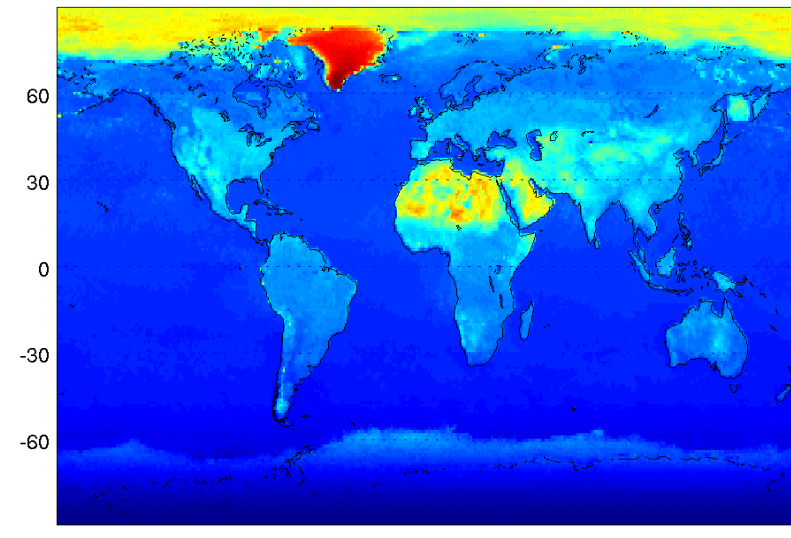
SWUPCLR
Jan-Feb-Mar 2006



Jul-Aug-Sep 2009



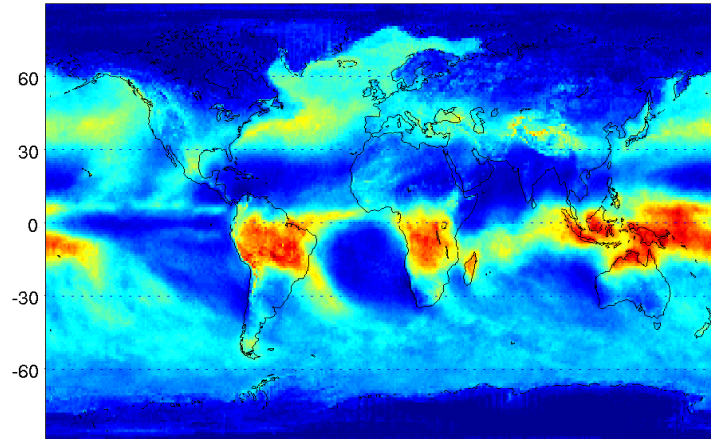
Jul-Aug-Sep 2006



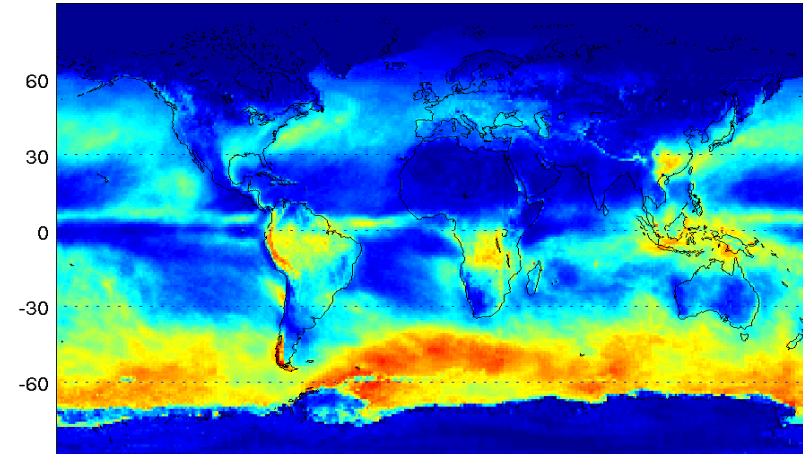
• *Long-wave*

Short-wave

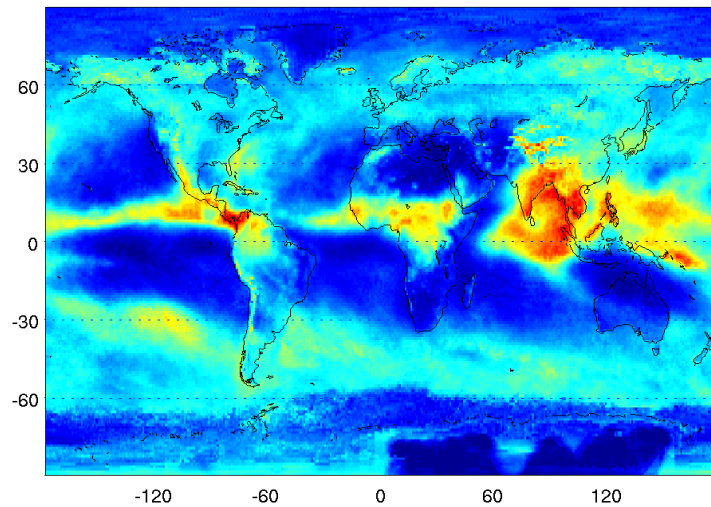
DIFF
Jan-Feb-Mar 2009



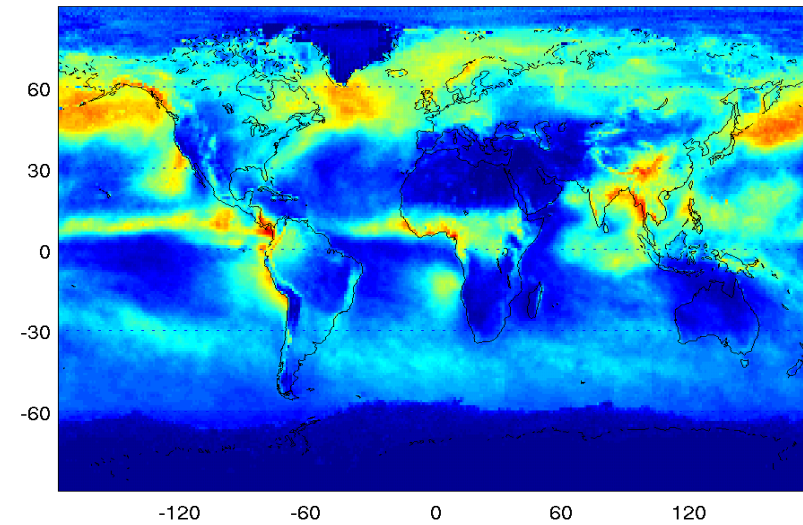
DIFF
Jan-Feb-Mar 2006



Jul-Aug-Sep 2009



Jul-Aug-Sep 2006



• *Long-wave*

Short-wave

10. **Brainstorm:** are radiative fluxes the only important variables for climate prediction?

→ *all*